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TM 5-4120

WAR DEPARTMENT TECHNICAL MANUAL

U.S. Dept. of Army

GRINDER, ELECTRIC, PORTABLE, ¾-H.P., 110-VOLT, UNIVERSAL MOTOR, 6-IN. WHEEL, INDEPENDENT PNEUMATIC, No. U60, MODEL 3032, WITH THOR, HORIZONTAL BENCH STAND, No. 60, MODEL 3473

★

MAINTENANCE INSTRUCTIONS AND PARTS CATALOG

WAR DEPARTMENT • 20 OCTOBER, 1944

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MAINTENANCE MANUAL
AND
PARTS CATALOG
FOR
GRINDER, ELECTRIC, PORTABLE,
3/4-HP, 110-VOLT,
UNIVERSAL MOTOR, 6-IN. WHEEL,
INDEPENDENT PNEUMATIC,
No. U60, MODEL 3032
WITH
THOR, HORIZONTAL BENCH STAND,
No. 60, MODEL 3473

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WAR DEPARTMENT

WASHINGTON 25, D. C. (20 OCTOBER, 1944)

TM5-4120, Grinder, Electric, Portable, ¾-HP, 110 Volt, Universal Motor, 6-in. Wheel, Independent Pneumatic, Model U60, with Thor, Horizontal Bench Stand, No. 60, Model 3473, is published for the information and guidance of all concerned.

A.G. 300.7 (12 August, 1944)

By order of the Secretary of War:

G. C. MARSHALL
Chief of Staff

Official

J. A. ULIO,
Major General,
The Adjutant General

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GENERAL DESCRIPTION OF GRINDER AND BENCH STAND

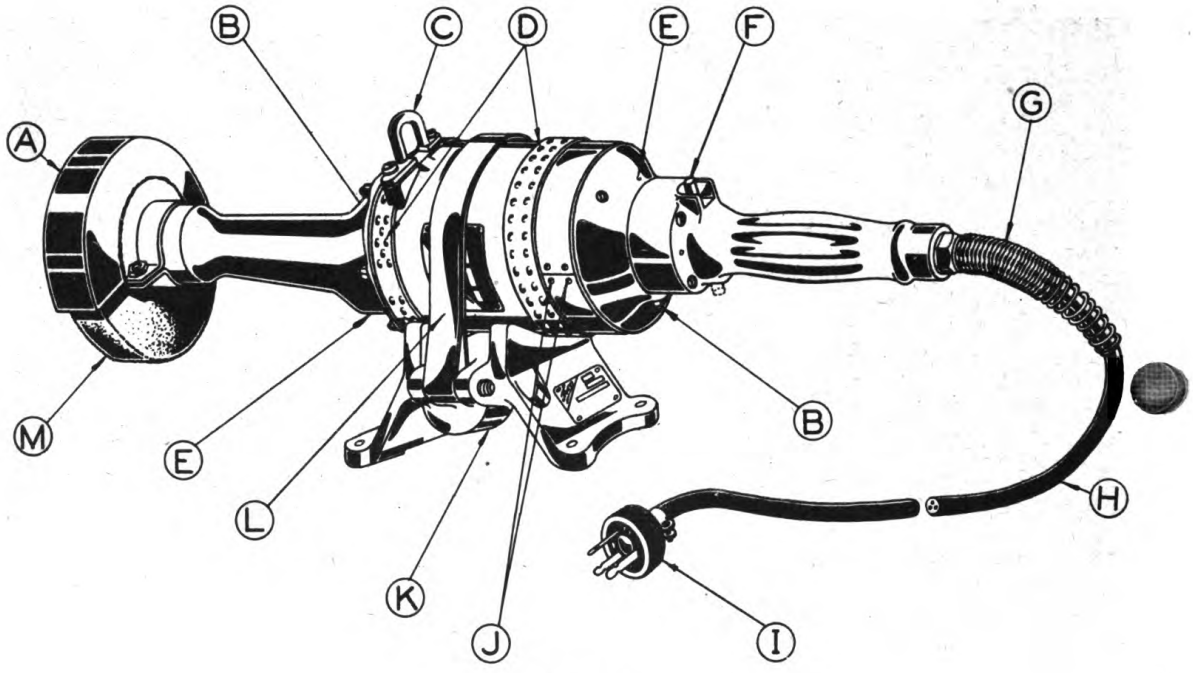

Figure 1

A--Grinding Wheel Guard
B--Grease Nipples
C--Suspension Hook
D--Inlet and Exhaust Ventilation Holes
E--Vent Holes
F--Switch Trigger
G--Cable Connector Spring
H--Electric Cable
I--Cable Plug
J--Brush Band
K--No. 60 Bench Stand
L--Bench Stand Clamp Band
M--Grinding Wheel

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GENERAL DESCRIPTION

The Thor No. U60 Portable Electric Grinder is powered by a universal electric motor for operation on either alternating or direct current and is designed for heavy-duty service. It is suitable for all types of grinding, wire brushing, buffing and polishing. The Thor portable Grinder may be converted into a stationary Grinder by clamping it in the Thor No. 60 Horizontal Bench Stand.

A--Grinding Wheel Guard

Grinding Wheel Guard can be adjusted by loosening 2 nuts. Never operate the Grinder without the grinding wheel guard. Should the wheel crack or break, the guard will tend to deflect the flying particles away from the operator.

B--Grease Nipples

Grease Nipples (2) located at upper and lower ends of motor, provide for application of grease to vital points with a grease gun. (See "LUBRICATION" Page 5).

C--Suspension Hook

Suspension Hook provides a means of suspending the Grinder above the work.

D--Inlet and Exhaust Ventilation Holes

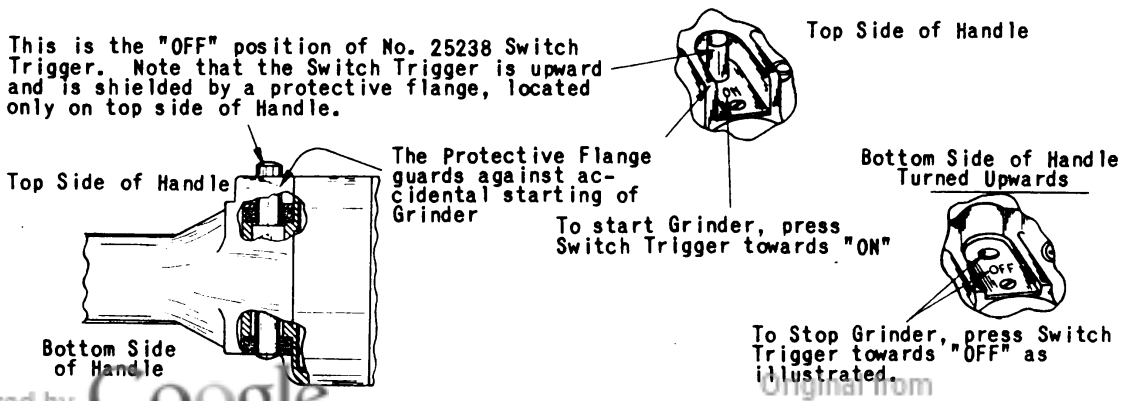
Inlet and exhaust ventilation holes are for ventilation and cooling of the motor. Air is drawn by a fan into the motor through the round inlet holes, and is forced out through the oval exhaust holes.

E--Vent Holes

Vent Holes (2) located at upper and lower ends of motor provide means for warm, expanding grease to escape rather than to penetrate into the motor.

F--Switch Trigger

CAUTION: Before connecting the Grinder to a power outlet, make sure that No. 25238 Switch Trigger is in an "OFF" position as shown in drawing below.



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G--Cable Connector Spring

Cable Connector Spring provides protection against excessive bending of the cable at end of Handle.

H--Electric Cable

Electric Cable is for transmission of the electric power to the grinder (See "POWER SUPPLY".)

I--Cable Plug

Cable Plug of the 3-prong type is for connection of the Cable to a suitable receptacle or power outlet. One prong on Cable plug is marked "GROUNDING".

J--Brush Band

Brush Band covers opening in field case through which the Carbon brushes are inspected and replaced. (See "INSPECTION AND REPLACEMENT OF NO. 59600 BRUSHES" Page 9).

K--No. 60 Bench Stand

No. 60 Bench Stand provides a means of converting the No. U60 Portable Electric Grinder into a stationary Bench Grinder. (See "INSTRUCTIONS FOR SETTING-UP NO. 60 BENCH STAND", Page 7.)

L--Bench Stand Clamp Band

Bench Stand Clamp Band clamps the No. U60 Portable Electric Grinder firmly in the No. 60 Bench Stand.

M--Grinding Wheel

Grinding Wheel consisting of fine abrasive particles, known as grains, which are held together by a bond, provides the cutting medium for grinding operations. Use wheels which are not affected by water, acid, oils, or ordinary temperature donditions. (See "GRINDING WHEELS", Page 4).

SPECIFICATIONS

Size No.	U60	Speed (R.P.M.).	4,000
Model No.	3032	Weight (Lbs.)	21-1/8
Grinding Wheel Capacity Bonded	6 in. x 1 in.	Length Overall. . .	26-3/8 in.
		Spindle Thread. .	5/8 in. x 11
Power Supply . .	105 to 115V. --D.C. or A.C. 60 cycles or less		

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CROSS-SECTION VIEW AND PARTS IDENTIFICATION

No. U60 Electric Grinder, Model 3032

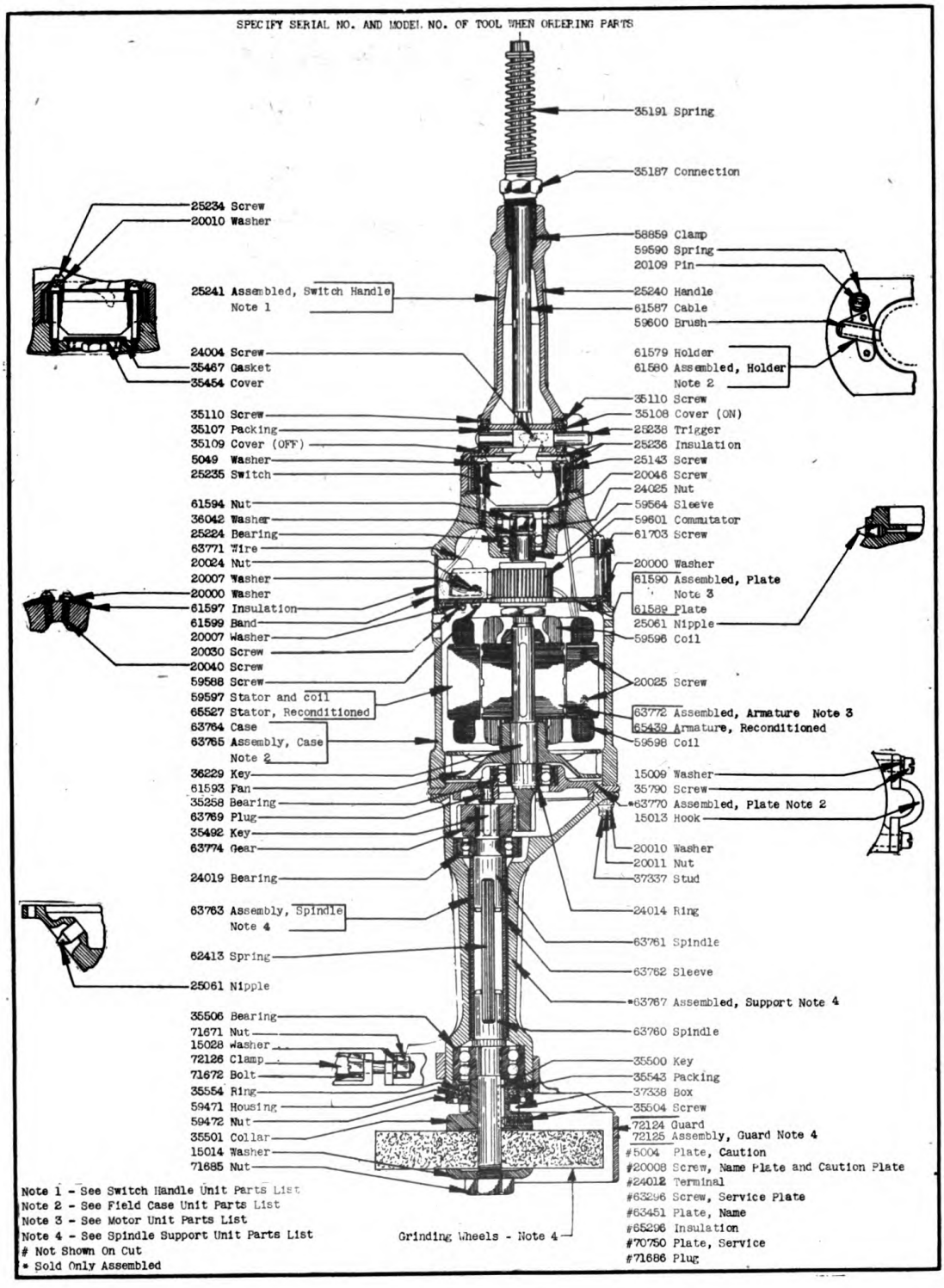

Figure 2

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WHAT TO DO

BEFORE PLACING GRINDER IN SERVICE

1. Fasten down No. 60 Bench Stand securely to bench and clamp No. U60 Electric Grinder into position in Bench Stand. (See "INSTRUCTIONS FOR SETTING-UP THOR No. 60 BENCH STAND", Page 7.)

2. Check grinding wheel for cracks and flaws. (See "GRINDING WHEELS", Page 4.)

3. Place grinding wheel on No. 63760 Spindle. (See "GRINDING WHEELS", Page 4.)

4. Apply grease through grease nipples. (See "LUBRICATION", Page 6.)

5. Check the power supply to see that it corresponds to the correct power supply as specified on the name plate. If an extension Cable is being used, be sure it is of the proper size. (See "POWER SUPPLY", Page 5.)

6. If Thor No. 60 Bench Stand is not being used, pick up the grinder so as to become accustomed to holding it.

7. Make sure that the switch trigger is in "OFF" position before connecting the Cable Plug. (See "F" under the "GENERAL DESCRIPTION", Page V.)

SAFETY AND OPERATING PRECAUTIONS

1. Always check condition of grinding wheel before mounting.

2. Always use Grinding Wheel Guard during operation.

3. Wear goggles or a face shield to protect the eyes.

4. Apply the grinding wheel to the work gradually until the wheel has had a chance to warm up.

5. Never lay the grinder down while grinding wheel is still turning.

6. Always <u>disconnect</u> cable plug from receptacle before adjusting wheel guard or replacing grinding wheel.

7. Make sure that the grinder is always grounded through "ground" prong in cable plug.

8. Carry the Grinder by the handle--<u>not the cable</u>.

9. Never turn the switch "ON" or "OFF" at the same time the grinding wheel is being applied to the work.

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GRINDING WHEELS

A. INSPECTION OF GRINDING WHEELS (See Fig. 2, Page 2)

1. Upon receipt, inspect all wheels closely to make sure that they have not been damaged.

2. Suspend the grinding wheel in air and tap it gently with a light implement, such as the handle end of a screw driver.

   a. If it sounds cracked, it should never be used.

   b. It is very important that the wheel be dry and free from sawdust when testing in the above manner, since moisture or sawdust may deaden the sound.

   c. It must be remembered that organic bonded wheels do not give off the same clear metallic ring which is characteristic of vitrified and silicate grinding wheels.

3. Grinding wheels should be tested occasionally for balance, and rebalanced if necessary. Wheels worn out-of-round and balance, which cannot be rebalanced by dressing, should be replaced.

4. If a grinding wheel should break, a careful inspection should be made of the Grinding Wheel Guard, No. 63760 Spindle, No. 71685 Grinding Wheel Nut, No. 15014 Grinding Wheel Washer and No. 35501 Driving Collar. Be sure No. 35504 Driving Collar Set Screw is securely tight.

B. PLACEMENT OF GRINDING WHEELS (See Fig. 2, Page 2)

1. Since the No. 63760 Spindle is free to rotate in either direction, No. 35501 Driving Collar has been provided with several slots for holding it when unscrewing No. 71685 Grinding Wheel Nut.

2. No. 63760 Spindle accommodates a grinding wheel with a 5/8" arbor hole.

3. When placing the grinding wheel on No. 63760 Outer Spindle, it is important that blotting paper washers (.025" in thickness) be placed between the flanges and grinding wheel to serve as a cushion.

4. Tighten the No. 71685 Grinding Wheel Nut just enough to hold the grinding wheel firmly on the No. 63760 Spindle between the No. 15014 Grinding Wheel Washer and No. 35501 Driving Collar.

5. Adjust the Grinding Wheel Guard over the Grinding Wheel.

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C. OPERATIONS WITH A NEW OR COLD WHEEL

1. All new wheels should be run at full speed for one minute before applying to the work. IMPORTANT--Hold the grinder to one side when making the above test.

2. A cold grinding wheel should not be forced against the work, but applied gradually, giving the wheel an opportunity to warm up, thereby minimizing the chance for breakage. This rule should be followed when starting work in cold rooms and with new wheels which have been stored in cold places.

3. Do not "gun" the grinder by rapidly turning the grinder on and off continuously, as the repeated increase and decrease in acceleration may cause the grinding wheel to break or the emery wheel nut to work loose.

D. STORAGE OF GRINDING WHEELS.

Great care should be taken as to the correct storage of the grinding wheels. Racks of suitable construction should be provided to accommodate the Grinding Wheels. A straight grinding wheel is best supported on edge in a rack or bin.

LUBRICATION

Proper and sufficient lubrication is the most important factor in maintaining maximum operating performance with a minimum of repairs.

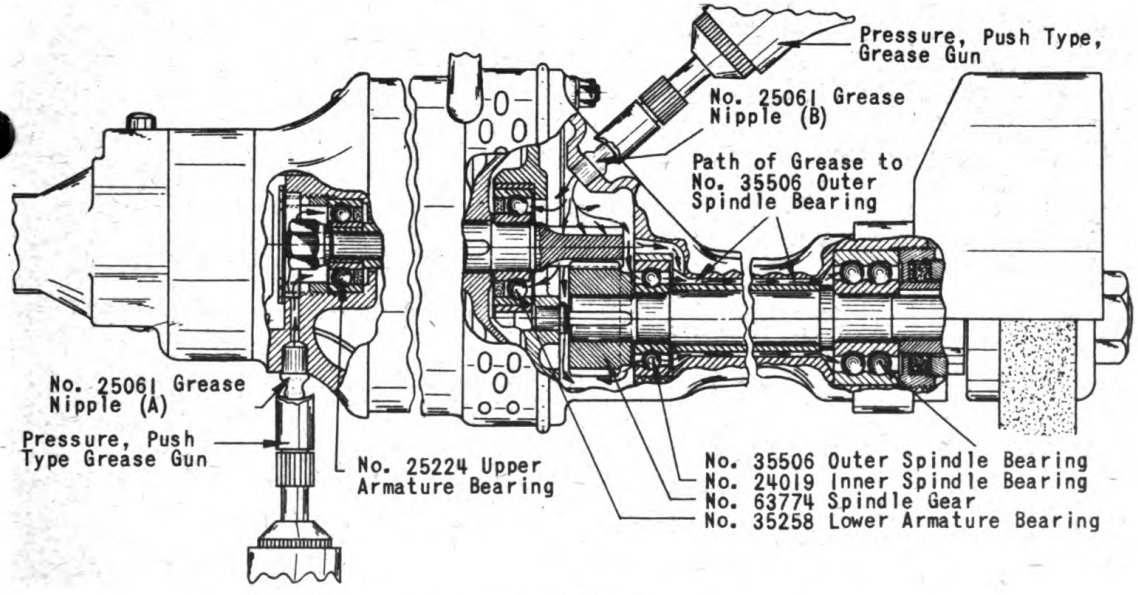

Figure 2A
Vital Points of Lubrication

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A small quantity of clean high grade cup grease of the proper viscosity (see table at right) should be inserted through the 2 No. 25061 Grease Nipples by means of a pressure grease gun at least once every 64 hours during continuous grinder operations.

ATMOSPHERIC TEMPERATURE	BEARING AND GEAR GREASE
32° F, and above	CG-Grease, General Purpose No. 1 U.S. Army Spec. No. 2-107
32° F. and below	CG-Grease, General Purpose No. 0 U.S. Army Spec. No. 2-106

Grease inserted through the upper No. 25061 Grease Nipple (A) passes to No. 25224 Upper Armature Bearing (see arrows in drawing). (Figure 2A, Page 5.)

Grease inserted through the lower No. 25061 Grease Nipple (B) passes to No. 35258 Lower Armature Bearing, Pinion on Armature Shaft, No. 63774 Spindle Gear, No. 24019 Inner Spindle Bearing, and works downward into No. 35506 Outer Spindle Bearing (see arrows in drawing). (Figure 2A, Page 5.)

OIL APPLICATION

No. 35543 Felt Packing and No. 35107 Dust Packings should be cleaned thoroughly in solvent and saturated with OE-30, (SAE 30) U.S. Army Specification 2-104B oil only when grinder is taken apart and serviced.

POWER SUPPLY

The Thor No. U60 Portable Electric Grinder is powered by a Universal Electric Motor which is operated on the following power supply specifications:

1. VOLTAGE SUPPLY

   110 Volts is normal but grinder may be operated on voltages which do not vary more than 5 per cent from the normal voltage. (105 to 115 Volts).

2. CURRENT SUPPLY (FREQUENCY)

   Direct or Alternating current may be used. If operated on alternating current, the frequency should never be greater than 60 cycles per second.

3. EXTENSION CABLE

   If an extension cable is necessary to reach a power outlet, it is very important that the wire in the cable be of sufficient size to carry the power supply to the grinder without any great drop in voltage. An appreciable drop in voltage results in loss of power and damage to the motor

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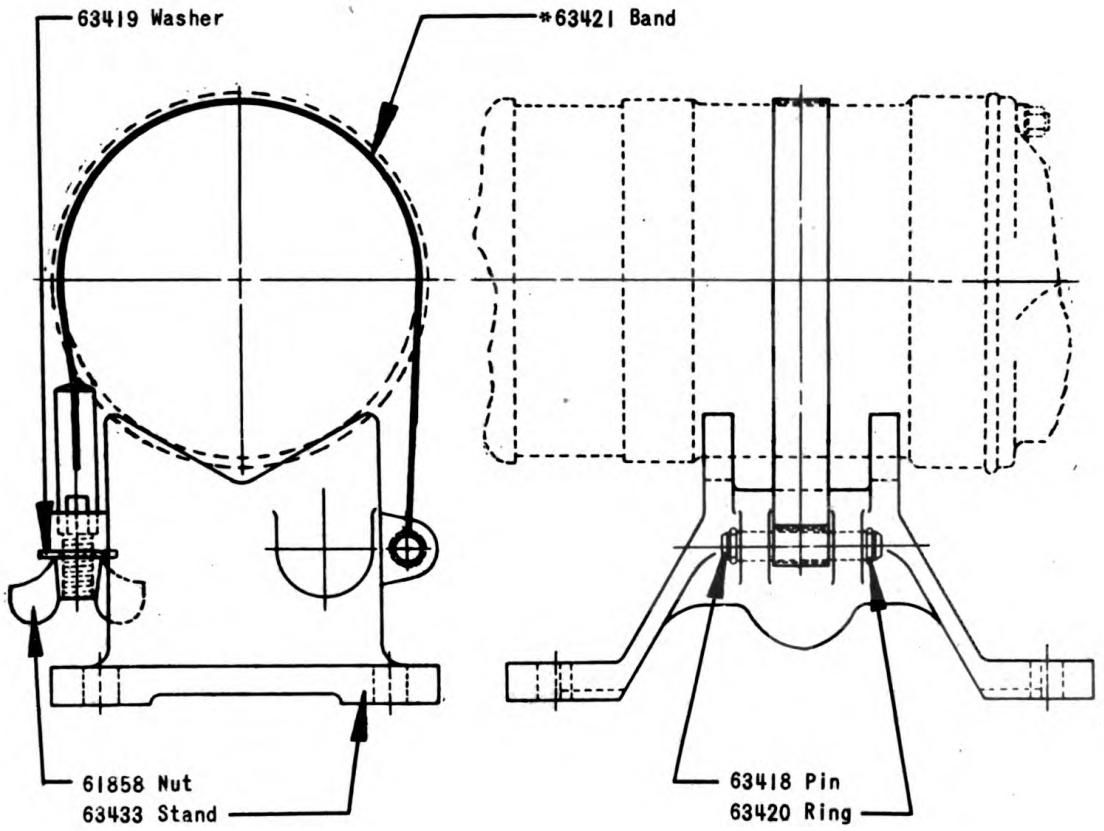
windings through overheating. See the following table for suitable wire sizes for various lengths of Extension cables.

WIRE SIZES FOR EXTENSION CABLES

LENGTH OF EXTENSION CABLE	WIRE SIZE (B. & S. GAUGE)
25 to 75 Feet	16
75 to 100 Feet	14
100 to 200 Feet	12

INSTRUCTIONS FOR SETTING UP THOR NO. 60 BENCH STAND



#20008 Screw, name plate
#64542 Plate, name

Not Shown On Cut
* Sold Only Assembled

Figure 3
Assembled View of Thor No. 60 Bench Stand

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INSTRUCTIONS FOR SETTING UP NO. 60 BENCH STAND (Continued)

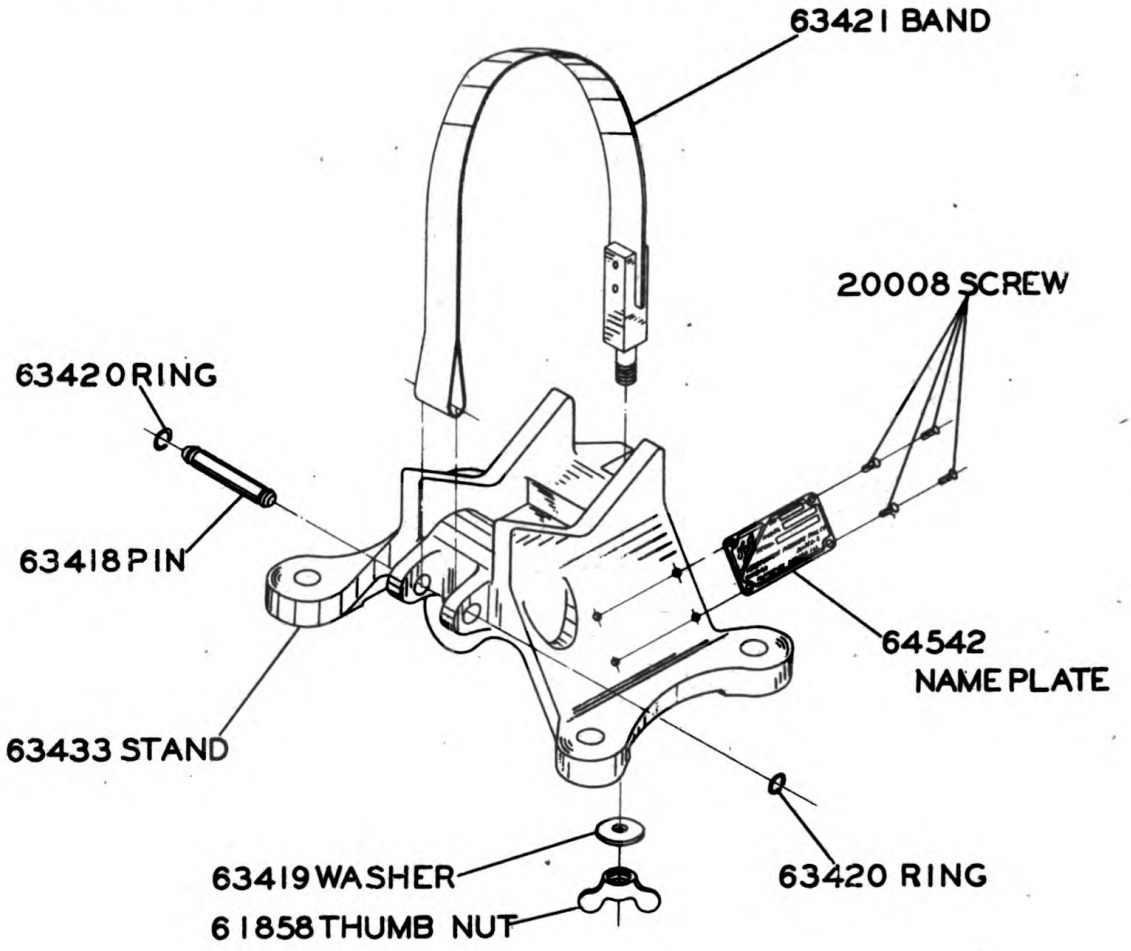

Figure 4
Exploded View of No. 60 Bench Stand

1. Bolt the Thor No. 60 Bench Stand down to a substantial bench or table or any other base used for convenience. CAUTION: USE PROPER SIZE BOLTS TO FASTEN THE BENCH STAND TO THE BENCH.

2. Loosen No. 61858 Clamp Band Thumb Nut from Lug on side of No. 63433 Stand and Swing No. 63421 Clamp Band free of the stand.

3. Place the Grinder in a convenient operating position in the cradle of Stand.

4. Circle No. 63421 Clamp Band over the Grinder, placing square section of Band into slotted lug and No. 63419 Washer and No. 61858 Nut under the Lug.

5. Securely tighten No. 61858 Clamp Nut before placing the Grinder into service.

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FIELD SERVICE OPERATIONS

The following servicing operations may be performed by the operator to insure the most efficient operation of the Grinder and to prevent unnecessary wear or damage.

A. LUBRICATION

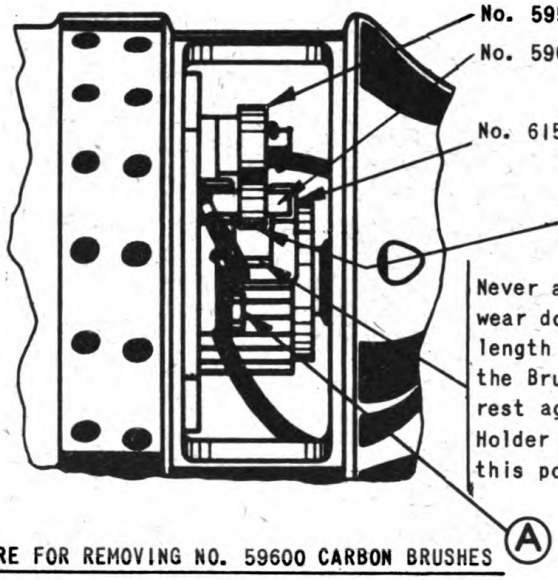
1. Follow the instructions as prescribed under "LUBRICATION". (Page 6)

2. It is very important that the correct grade lubricants are used for various temperature conditions.

3. A grease gun is used for applying grease through the grease nipples.

B. INSPECTION AND REPLACEMENT OF NO. 59600 BRUSHES

It is very important that the 2 No. 59600 Carbon Brushes are replaced if they are broken, chipped or worn down to 3/4 inch in length as shown in Figure 5.



PROCEDURE FOR REMOVING NO. 59600 CARBON BRUSHES

1. Detach Brush lead from Brush Holder Terminal (A).
2. Lift up No. 59590 Brush Spring at point (B) and remove NO. 59600 Carbon Brush.

NOTE: Replace No. 59600 Carbon Brushes when chipped, broken or worn down to this dimension.

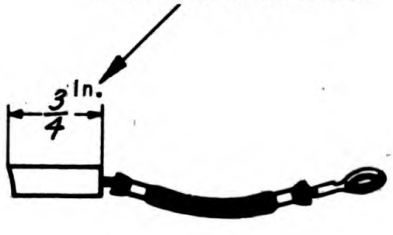


Figure 5
Inspection of No. 59600 Carbon Brushes

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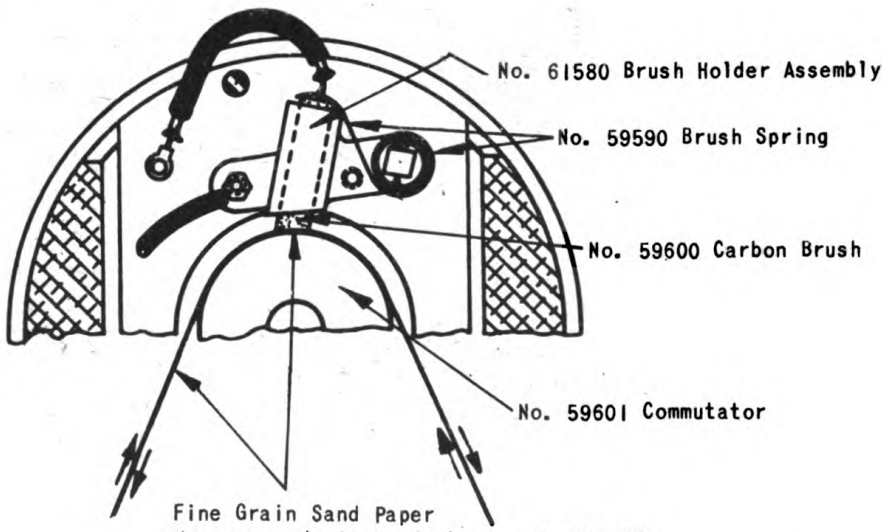
After replacement of the Brushes, they should be occasionally inspected at first to arrive at a fairly close estimate as to how long they may be used before replacing them.

After removing the 4 No. 20040 Brush Band Screws and sliding No. 61599 Brush Band and No. 61597 Brush Band insulation off No. 63765 Field Case, the No. 59600 Carbon Brushes are exposed for inspection and replacement as shown in Figure 5.

IMPORTANT: NEVER ALLOW THE NO. 59600 CARBON BRUSH TO WEAR DOWN UNTIL THE ARM OF NO. 59590 SPRING RESTS AGAINST THE NO. 61580 BRUSH HOLDER ASSEMBLY.

If this condition occurs, the No. 59600 Carbon Brush is not held to the No. 59601 Commutator and the sparking and heating that results damages the motor. Carbon brushes in a chipped condition will also cause sparking.

The Brushes should be replaced by Thor Brushes since their composition has been carefully selected to meet the requirements of the particular type of motor and service conditions.



Fine Grain Sand Paper (approx. 3/4 inch wide) placed with its non-abrasive side against Commutator and abrasive side against No. 59600 Carbon Brush.

PROCEDURE FOR FITTING BRUSHES TO COMMUTATOR

1. Place Sand Paper between commutator and Brush Holder.
2. Insert No. 59600 Brush into No. 61580 Brush Holder Assembly and place No. 59590 Brush Spring against the Brush as shown above.
3. Work Sand Paper back and forth in direction of short arrows on drawing above until the Brush assumes same curvature as of Commutator surface.
4. Remove Brush and clean thoroughly of all traces of abrasive particles.

Figure 6
Fitting No. 59600 Carbon Brushes to Commutator

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When replacing the No. 59600 Carbon Brushes and to insure a close and complete fit between the brushes and No. 59601 Commutator to prevent a sparking condition, the following operations may be performed:

1. Lay a strip of fine grain sand paper (Approx. 3/4 inch in width) between the No. 59601 Commutator and No. 61580 Brush Holder Assembly so that the smooth non-abrasive side of the sand paper rests against the Commutator.

2. Insert the Carbon Brush in the Brush Holder Assembly and place the No. 59590 Brush Spring against the brush as shown in Figure 6.

3. Now work the sand paper back and forth between the Commutator and brush several times until the curvature on the end of the brush is the same as that of the Commutator surface.

4. Remove the No. 59600 Carbon Brush and clean thoroughly to remove all traces of abrasive particles.

C. REPLACEMENT OF NO. 35107 TRIGGER DUST PACKINGS (Fig. 9, Page 16)

The purpose of the 2 No. 35107 Trigger Dust Packings located around No. 25238 Switch Trigger is to prevent entry at this point of dust and grinding particles, which would cause short circuits or damage to the No. 25235 Switch.

If the Trigger Dust Packings are worn they may be replaced after removing the No. 35108 and No. 35109 Trigger Packing Covers.

"LIMITED STORAGE"

Instructions for Preparation of Unit for 30 days or less:-

Refer to Page 5 for Proper Lubrication. Grease Unit as outlined in "A", Page 6. Clean Unit of all Dirt, Abrasive or Moisture, inside or out and keep in dry place.

"DEAD STORAGE"

Refer to TM-5-9715 (Under Pneumatic Tools), Preparation of Corps of Engineers equipment for storage, issued by Maintenance Division, Military Supply Office, Chief of Engineers, P. O. Box 1679, Columbus, Ohio.

EXPORT SHIPMENT

Refer to TM-5-9711 Preparation of Corps of Engineers Equipment for Export issued by Maintenance Division, Military Supply, Office of Chief of Engineers, P. O. Box 1679, Columbus, Ohio.

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SUMMARY OF SERVICING OPERATIONS

Proper and complete maintenance and servicing of the Thor No. U60 Electric Grinder requires thorough inspection and cleaning of every part and relubrication of all moving parts at least once every 1024 hours of operation. If the Grinder is used continuously under extremely abrasive air conditions, the servicing job should be performed more frequently.

To perform this servicing, each MAJOR UNIT of the Grinder (See "IDENTIFICATION OF MAJOR UNITS" Figure 8, Page 15.) should be disassembled into its component parts and serviced as follows:

1. Thoroughly inspect each moving part for worn bearing surfaces as well as for corroded sections.
2. If the part is badly worn and beyond repair, it should be replaced.
3. Assembly of new parts in conjunction with badly worn moving parts may cause rapid failure of both parts.
4. Thoroughly clean each part in a dirt and grease cutting solvent.
5. Lubricate, with the recommended oil and grease, the parts that require lubrication. (See "LUBRICATION", Page 6.)
6. Reassemble the component parts of each MAJOR UNIT.

ALL MAJOR UNITS, each having been properly serviced, may then be assembled together to complete the final assembly of the Grinder.

INTERPRETATION OF PARTS

When reading the following maintenance instructions, refer frequently to the exploded view as well as to the cross-sectional drawings of the assembled tool to become acquainted with symbol number and description of the parts, and appearance or design of each part and its relationship with the parts adjacent to it.

TEST LAMP

A simple test lamp as shown in Figure 7 at the right may be used very effectively in testing for open or grounded electrical circuits. Note that lamp is placed in series, thereby directing all current through it--lighting it, if circuit being tested is complete. The Test Lamp Unit is plugged into a 110 Volt Power Outlet and the terminals are placed at opposite ends of the circuit being tested.

NOTE: Test Lamp is not furnished with Tool.

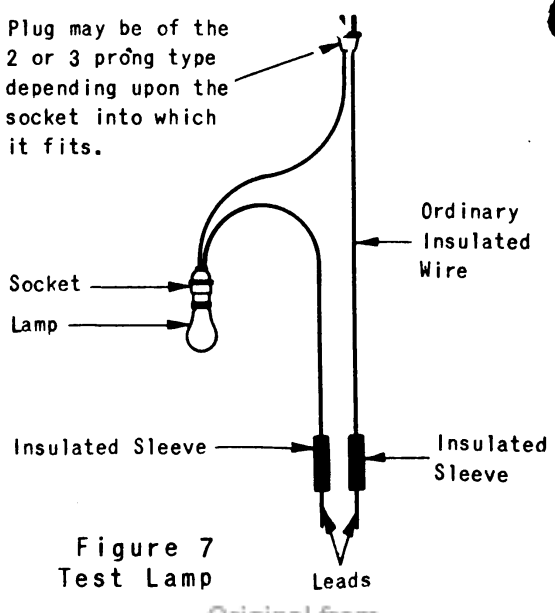

Figure 7
Test Lamp

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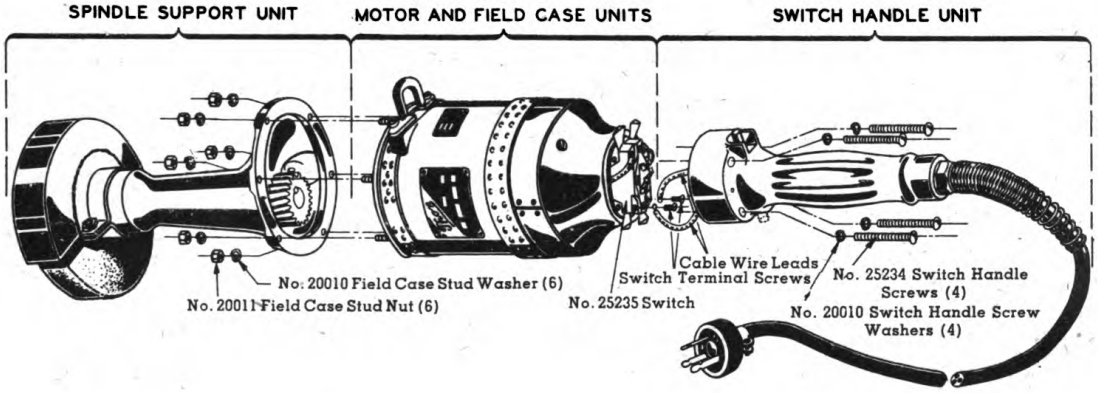
IDENTIFICATION OF MAJOR UNITS

The Thor No. U60 Electric Grinder may be divided into four (4) Major Units or unit assemblies, namely, SWITCH HANDLE UNIT, MOTOR UNIT, FIELD CASE UNIT, and SPINDLE SUPPORT UNIT. Figure No. 8 Illustrates the primary stage in the disassembly of the Grinder into its four MAJOR UNITS. (Note that the MOTOR UNIT and FIELD CASE UNIT are shown as one unit since the MOTOR UNIT is contained in the FIELD CASE UNIT.)



NOTE: To separate MOTOR AND FIELD CASE UNITS, see "SEPARATION OF MOTOR UNIT FROM FIELD CASE UNIT" under "SERVICING OF MOTOR UNIT." (Page 25).

Figure 8
Illustration showing the 3 Major Units of the Grinder

DISASSEMBLY OF THE GRINDER INTO MAJOR UNITS

The Grinder is separated into its four MAJOR UNITS as follows (Figure 8):

1. Remove the 4 No. 25234 Switch Handle Screws and carefully pull the Switch Handle Unit from the Motor and Field Case Units. Disconnect the cable wire leads from No. 25235 Switch by removing the two Switch Terminal Screws.

2. Unscrew the 6 No. 20011 Field Case Stud Nuts and pull the Spindle Support Unit from the Motor and Field Case Units.

3. For separation of the Motor Unit from the Field Case Unit, refer to "SEPARATION OF MOTOR UNIT FROM FIELD CASE UNIT" under "SERVICING OF MOTOR UNIT", Page 25.

Servicing operations pertaining to each Major Unit may now be started.

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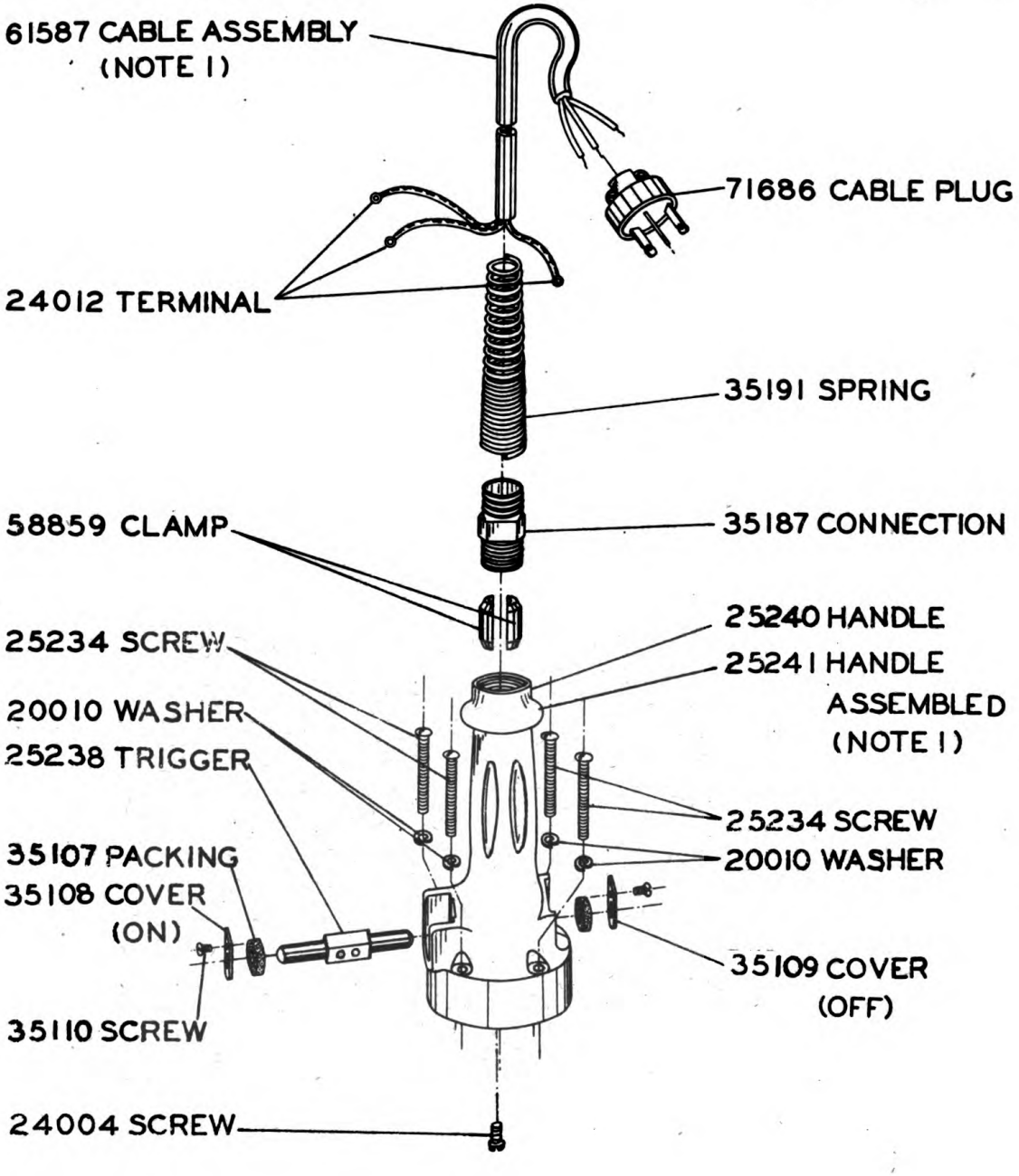
EXPLODED VIEW OF SWITCH HANDLE UNIT



NOTE 1- SEE NUMERICAL PARTS LIST FOR SWITCH HANDLE UNIT

Figure 9

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SERVICING OF SWITCH HANDLE UNIT
(Figure 9, Page 16)

Testing and Replacement of 61587 Cable

A broken wire in No. 61587 Cable, exclusive of the Grounding Wire, will cause failure of Grinder to operate. Testing of a broken wire in No. 61587 Cable is as follows:

A. TESTING OF THE CABLE WIRES ARE AS FOLLOWS:

1. Place leads of a test lamp (Figure 7) to the opposite ends of the same wire in the Cable.

2. If Test Lamp fails to light, the wire is broken.

3. All 3 wires in No. 61587 Cable should be tested in this manner.

B. REPLACEMENT OF NO. 61587 CABLE IS AS FOLLOWS: (Figure 9)

1. Disconnect Grounding Wire in No. 25241 Switch Handle Assembly by removing No. 24004 Grounding Wire Screw.

2. Loosen No. 35187 Cable Connection at end of No. 25241 Switch Handle Assembly.

3. Pull No. 61587 Cable from No. 25241 Switch Handle Assembly. (At this point, No. 35191 Cable Connector Spring may be replaced, if necessary. The Spring unscrews from the No. 35187 Cable Connection.)

4. Insert No. 61587 Cable through Handle far enough for easy attachment of Cable Wire Leads to No. 25235 Switch, located in the Field Case Unit.

5. Tighten No. 35187 Cable Connection securely, to clamp No. 58859 Cable Connector Clamp (two halves) against No. 61587 Cable.

6. Be sure to fasten Grounding Wire securely to No. 25241 Switch Handle Assembly by means of No. 24004 Grounding Wire Screw. THIS IS VERY IMPORTANT.

No. 35107 Trigger Dust Packings (Figure 9)

It is very important that No. 25235 Switch is protected from abrasive or dust particles. For this reason, it is essential that the 2 No. 35107 Trigger Dust Packings are replaced when considerably worn where they fit against the No. 25238 Switch Trigger.

To inspect and replace the No. 35107 Dust Packings, remove No. 35108 and 35109 Trigger Packing Covers.

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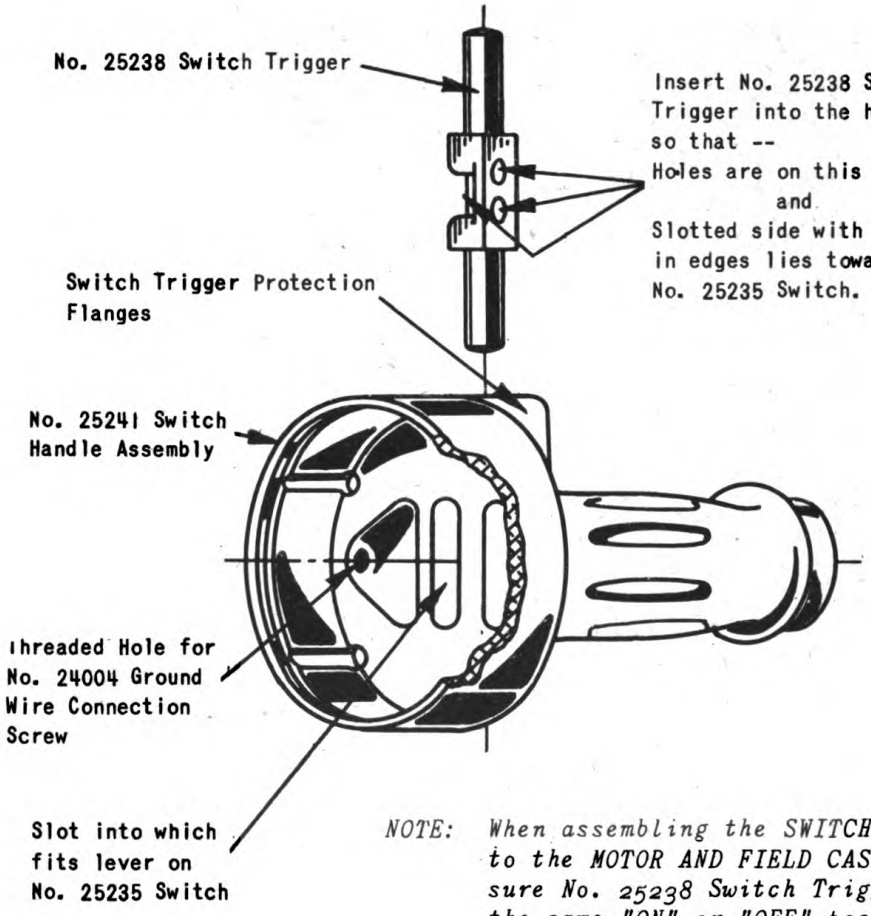
ASSEMBLY OF NO. 25238 SWITCH TRIGGER

Correct assembly of No. 25238 Switch Trigger into No. 25241 Switch Handle Assembly is important so that the Lever on No. 25235 Switch enters slot in No. 25238 Switch Trigger. Figure 10 shows the correct position of No. 25238 Switch Trigger before insertion into No. 25241 Switch Handle Assembly.



NOTE: When assembling the SWITCH HANDLE UNIT to the MOTOR AND FIELD CASE UNITS, be sure No. 25238 Switch Trigger is in the same "ON" or "OFF" position as the Switch Lever on No. 25235 Switch so that the parts will engage.

Figure 10
Assembly of Trigger into Handle

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SERVICING OF FIELD CASE UNIT

Important parts which are contained in the FIELD CASE UNIT and require inspection and replacement, if necessary, are as follows:

1. No. 25235 Switch
2. No. 25224 Upper Armature Bearing
3. No. 59600 Carbon brushes
4. No. 59590 Brush Spring

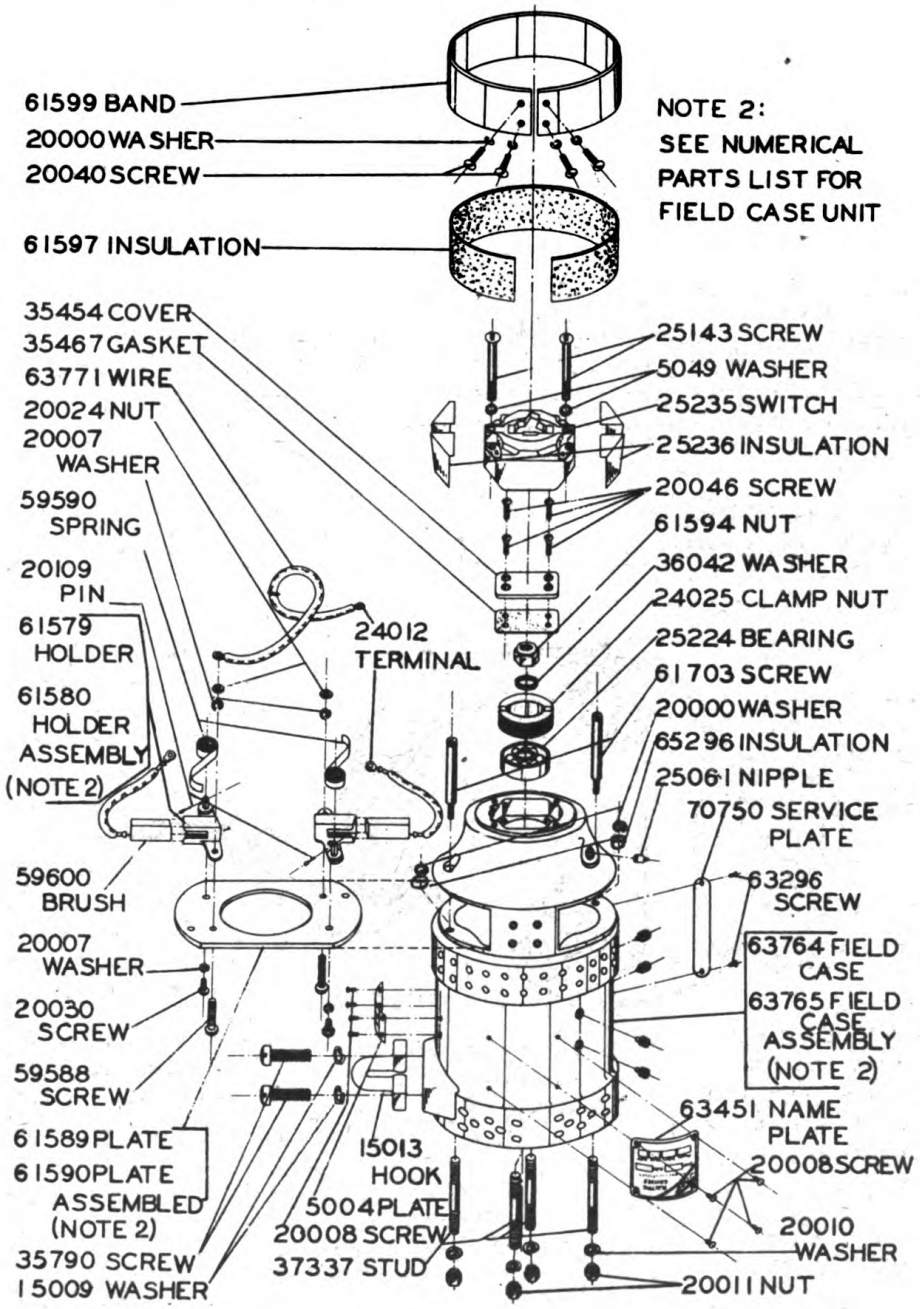

Figure 11
Exploded View of Field Case Unit

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No. 25235 Switch (Figure 11, Page 19 and Figure 12, below)

A defective No. 25235 Switch will result in failure of Grinder to operate.

No. 25235 Switch is removed from the Field Case Unit as follows:

1. Disconnect wire leads to switch.
2. Remove the 2 No. 25143 Switch Screws.

No. 25235 Switch is of the double pole type, in that it consists of 2 parallel circuits which are individually connected and disconnected when Switch is turned "ON" and "OFF".

To test No. 25235 Switch for completeness of each circuit, turn switch "ON" and place the leads of a test lamp against 2 opposite terminals on the switch. If the Test Lamp lights, the circuit is complete. If the test reveals a defective circuit, No. 25235 Switch must be replaced.

When assembling No. 25235 Switch to No. 63765 Field Case Assembly, refer to Figure 12 which shows the correct end for end assembled position of the Switch in respect to the "ON" and "OFF" notations on the Switch Lever.

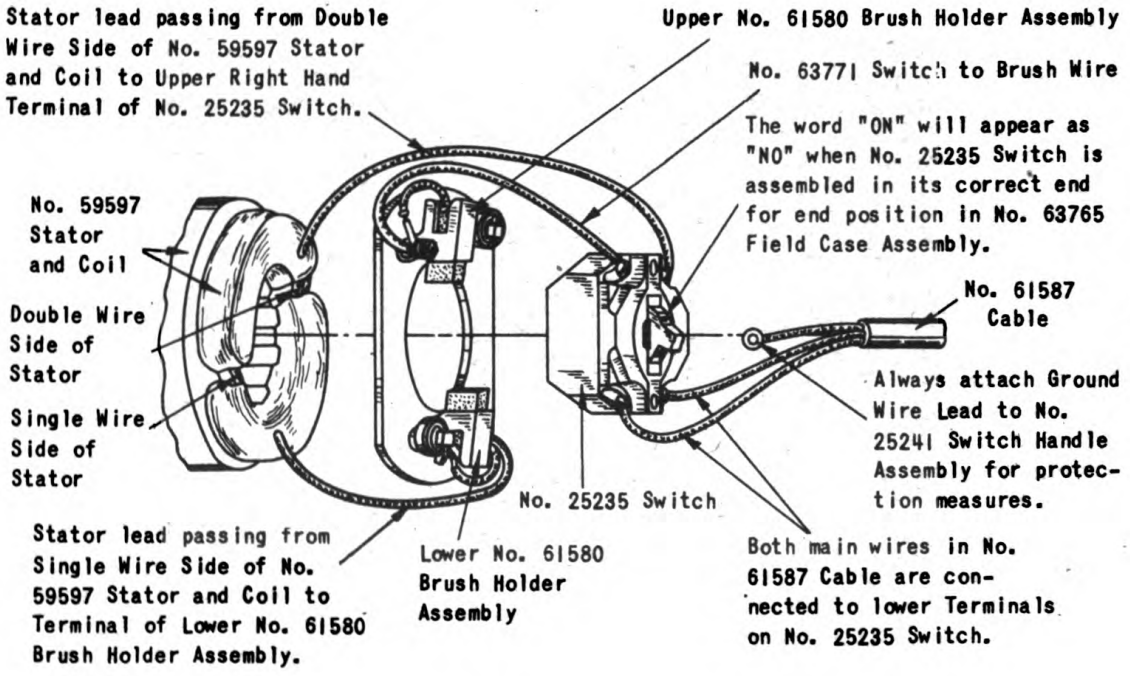

Figure 12
Wire Connections

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GENERAL SERVICING OPERATIONS FOR ALL BALL BEARINGS

A Bearing, whether it is assembled tightly in a housing, seat, or on a shaft, should never be removed forcibly from its assembled position, unless the Bearing is considerably worn and must be replaced. Unnecessary removal of the Bearing might result in damage to it and therefore the Bearing should be cleaned, inspected and regreased in its assembled position.

1. INSPECTION OF A BALL BEARING: If the inner and outer ball races of the Bearing may be deflected considerably in opposite parallel directions, indicating end play, the Bearing should be replaced. This condition is due most likely to worn ball race grooves. If the condition of Bearing is doubtful, it should be replaced.

2. CLEANING OF A BALL BEARING: A Ball Bearing should be washed by submerging it under the surface of a solvent, holding the inner ball race and spinning the outer ball race until the Bearing is clean. NEVER CLEAN THE BEARING BY BLOWING OUT THE OLD GREASE AND OIL WITH COMPRESSED AIR. Compressed air often contains abrasives which may become lodged in the Bearing, resulting in rapid failure.

3. REASSEMBLY OF A BALL BEARING ONTO A SHAFT OR INTO A SEAT:

   A. When pressing Bearing onto a shaft, apply pressure only to the inner ball race.

   B. When pressing Bearing into a seat, socket or housing, apply pressure only to the outer ball race.

   Pressure applied through the balls may cause indentation of the ball race grooves, resulting in rapid bearing failure.

4. LUBRICATION OF BALL BEARINGS: After reassembly of Bearing into its correct position, it should be packed with the proper grade of grease as recommended for various temperature conditions. (See "LUBRICATION", Page 6.)

No. 25224 Upper Armature Bearing (Figure 11)

(Refer to "GENERAL SERVICING OPERATIONS FOR ALL BALL BEARINGS", above.)

If No. 25224 Upper armature bearing must be replaced, it is accomplished as follows:

1. Remove No. 35454 Upper Armature Bearing Cover.

2. Unscrew No. 24025 Upper Armature Bearing Clamp Nut out of No. 63765 Field Case Assembly.

3. Remove No. 61594 Armature Shaft Nut and pull No. 63772 Armature out of lower end of No. 63765 Field Case Assembly.

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4. No. 25224 Upper Armature Bearing may now be pressed out of No. 63765 Field Case Assembly from the inside.

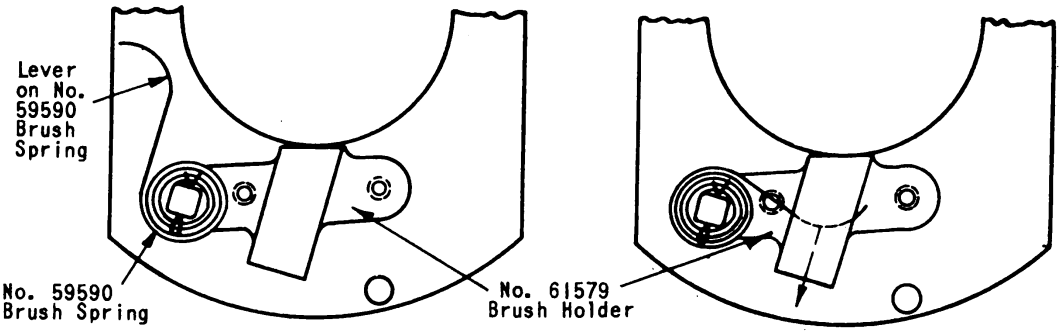
5. No. 25224 Upper Armature Bearing is a single side sealed Bearing. It is very important that the Bearing is assembled into No. 63765 Field Case Assembly so that its sealed side faces inward (As shown in Figure 11, Page 19.)

No. 59600 Carbon Brushes

Refer to "INSPECTION AND REPLACEMENT OF NO. 59600 BRUSHES", (Page 9), which gives full details as to inspection and replacement of the Carbon Brushes. Note that removal of No. 61590 Brush Plate Assembly is not necessary.

No. 59590 Brush Spring (Figure 13)

No. 59590 Brush Spring must produce a 11-to 15-ounce pressure against No. 59600 Carbon Brush as shown in Figure 14. If the pressure is less, No. 59590 Brush Spring should be replaced. In Figure 13 note correct assembly of No. 59590 Brush Spring to square peg in No. 61579 Brush Holder.



ASSEMBLY OF BRUSH SPRING TO BRUSH HOLDER

Assemble No. 59590 Brush Spring on to square peg of No. 61579 Brush Holder so that the arm of No. 59590 Brush Spring is in location as shown.

TESTING TENSION OF BRUSH HOLDER SPRING

Place arm of No. 59590 Brush Spring into slot of No. 61579 Brush Holder. The tension of arm of No. 59590 Brush Spring in direction of arrow, as shown above, should be between 11 and 15 ounces.

Figure 13 Figure 14

Assembly of Brush Springs

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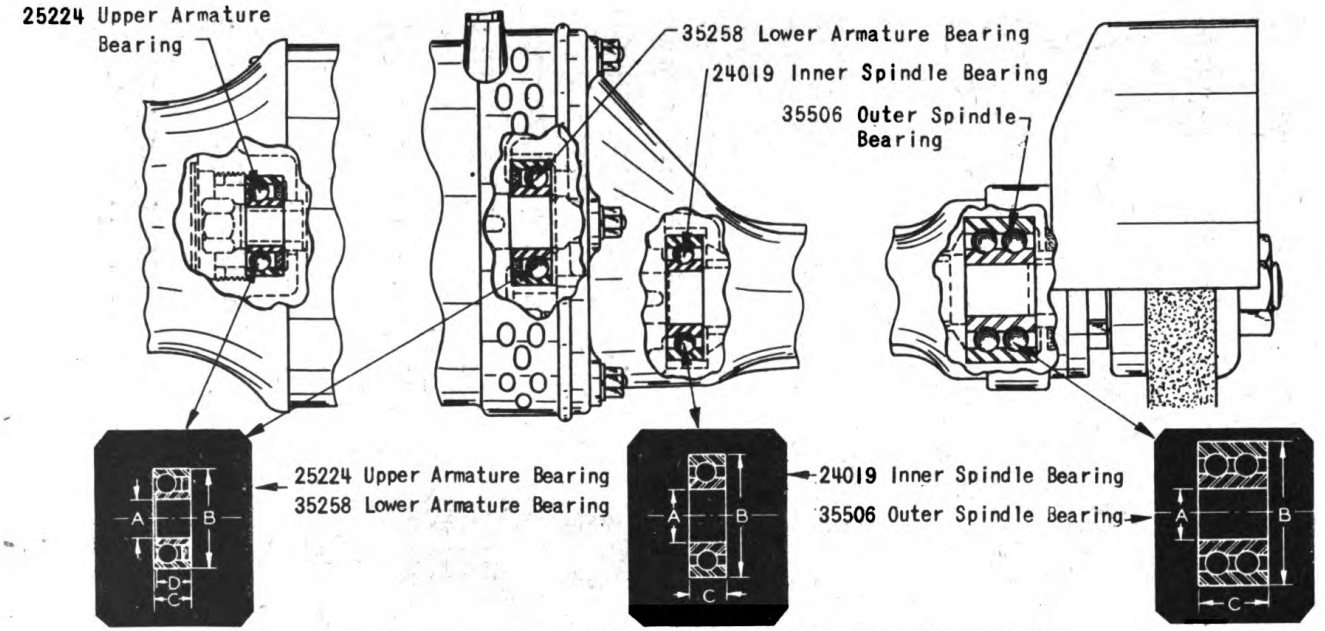
LOCATION, SIZES AND TOLERANCES OF BALL BEARINGS (Figure 14A)



Refer to Table below for Values of (A), (B), (C), and (D).

Figure 14A
Sizes and Tolerances of Ball Bearings

SYMBOL NUMBER AND DESCRIPTION	STYLE	INSIDE DIAMETER (A)		OUTSIDE DIAMETER (B)		WIDTH .000" -.005"		BALLS	
		INCHES	TOLERANCE .0000" to minus	INCHES	TOLERANCE .0000" to minus	(C)	(D)	NO.	DIA.
24019 Inner Spindle Bearing	Single Row Radial Ball Bearing	.6693	.0003 In.	1.5748	.0005 In.	.4724 In.		8	9/32 In.
25224 Upper Armature Bearing	Single Row, Single Felt Seal, Radial Ball Bearing	.4724	.0003 In.	1.2598	.0005 In.	..005 In.	.480 In.	7	1/4 In.
35258 Lower Armature Bearing	Single Row, Single Felt Seal, Radial Ball Bearing	.6693	.0003 In.	1.5748	.0005"In.	.563 In.	.538 In.	8	9/32 In.
35506 Outer Spingle Bearing	Double Row, Radial Ball Bearing	.6693	.0003 In.	1.8504	.0005"In.	.875 In.		18	3/8 In.

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EXPLODED VIEW OF MOTOR UNIT

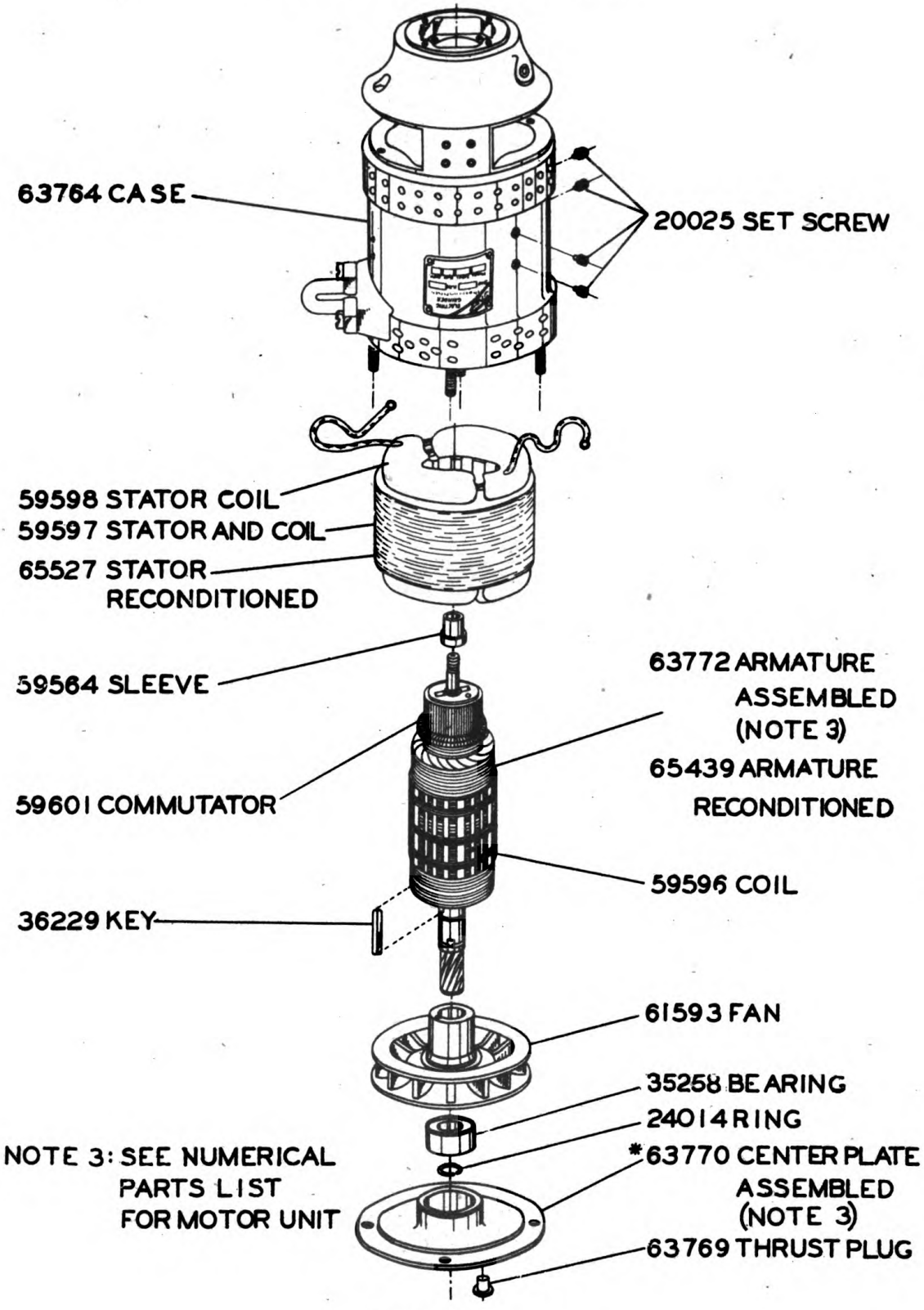

Figure 15

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SEPARATION OF MOTOR UNIT FROM FIELD CASE UNIT
(See Figure 15, Page 24)

The Motor Unit is separated from the Field Case Unit as follows:

1. No. 63772 Armature is disconnected from No. 25224 Upper Armature Bearing after removal of No. 61594 Armature Shaft Nut. (Refer to "No. 25224 UPPER ARMATURE BEARING", Page 21)

2. Pry No. 63770 Center Plate Assembly off No. 63764 Field Case evenly around its entire edge. (Figure 15)

3. No. 63772 Armature, No. 61593 Fan, No. 35258 Lower Armature Bearing, and No. 63770 Center Plate Assembly are removed from No. 63764 Field Case as a unit.

4. No. 59597 Stator should not be removed from No. 63765 Field Case Assembly unless it is absolutely necessary. If its removal is necessary, it is accomplished as follows:

   A. Disconnect wire lead from No. 59597 Stator to Brush Terminal.

   B. Remove the 4 No. 20025 Stator Set Screws.

   C. Tap lower end of No. 63764 Field Case against a hard wood block to force Stator down and out of Field Case.

No. 63772 Armature (Figure 15)

Inspection of No. 63772 Armature for open, grounded and short circuits is as follows:

1. OPEN CIRCUIT: An open circuit is characterized by a badly burned spot located between 2 adjacent commutator segments. If the open circuit is due to a wire being loose at No. 59601 Commutator, it can easily be repaired by soldering. If the broken wire is inside, the armature must be rewound or replaced.

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2. GROUNDED CIRCUIT: A grounded circuit may be determined by means of a Test Lamp as follows: Place one lead from Test Lamp to a commutator segment and other lead to armature lamination. If Test Lamp lights, a grounded circuit is present in which case No. 63772 armature must be rewound or replaced. It is for the protection of operator against this condition of grounded circuit that the Grinder should always be grounded through means of the grounding prong on the 3-prong plug.

3. SHORT CIRCUIT: A short circuit is noticeable by the manner in which the Grinder operates. If the Grinder operates slowly, has little power, and heats and smokes when operated for only a few minutes under no load, a short circuit may be present in which case No. 63772 Armature must be rewound or replaced.

It is very important that the Pinion on end of Armature Shaft is in good condition. If the teeth are worn down on the sides, or if they are cracked or broken, No. 63772 Armature should be replaced. (See "No. 63774 SPINDLE GEAR", Page 33.)

No. 59601 Commutator (Figure 15)

For positive electrical contact with the No. 59600 Carbon Brushes, the copper segmented surface of No. 59601 Commutator should be resurfaced if grooved or darkened in appearance. A fine grain sandpaper (#00) may be used if the grooves are not too deep. Otherwise, the surface may have to be resurfaced in a lathe using a cutting tool. In either case the mica insulation between the segments should be undercut to prevent No. 59600 Carbon Brushes jumping and causing pitting. NEVER USE EMERY CLOTH TO POLISH THE COMMUTATOR SURFACE.

No. 35258 Lower Armature Bearing (Figure 15)

(Refer to "GENERAL SERVICING OPERATIONS FOR ALL BALL BEARINGS", Page 21.)

If No. 35258 Lower Armature Bearing must be replaced, it may be accomplished by several methods as follows:

1. Figures 16 and 17 show a method of removing No. 35258 Lower Armature Bearing by means of a No. 67137 Bearing Puller.

2. Figures 18 and 19 also show a method that may be used. It will be noticed in this method that the No. 61593 Fan must be partially moved from its assembled position in order to remove the Bearing. The operation must be done carefully since damage might occur to No. 61593 Fan if the Bearing is tightly seated on the Armature Shaft. For this reason, this method is suggested only when a No. 67137 Bearing Puller is not available or when No. 61593 Fan must be removed also. The method as shown in Figures 16 and 17 is recommended for removing the Bearing only.

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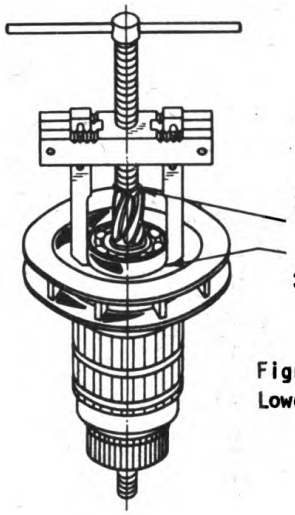
REMOVAL OF LOWER ARMATURE BEARING AND FAN

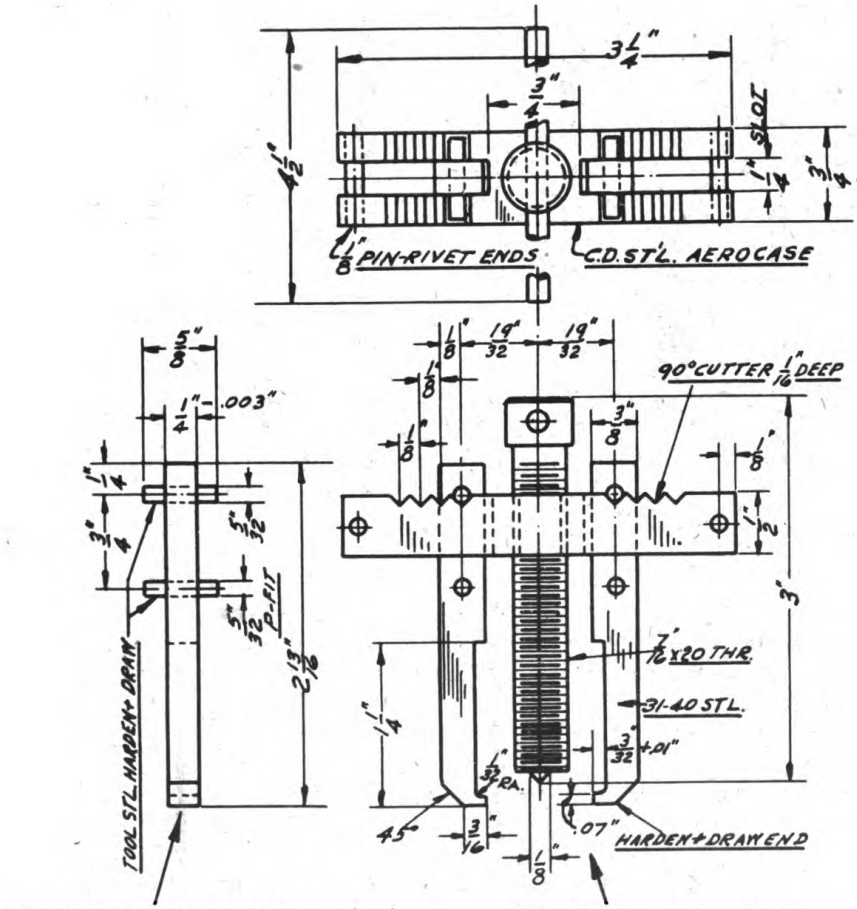


METHOD OF REMOVING NO. 35258 BEARING

1. Snap off No. 24014 Retainer Ring (Not shown here).
2. Place Extractor Screw against Pinion end and extractor claws under the bearing as shown
3. Turn Extractor Screw in a clockwise direction to pull the Bearing.

Figure 16 illustrates method of removing the No. 35258 Lower Armature Bearing with a No. 67137 Bearing Puller.

Figure 16



No. 72113 Bearing Puller Claws for No. 67137 Puller

No. 67137 Bearing Puller Complete

Figure 17 is a detail drawing of No. 67137 Bearing Puller.

Figure 17

NOTE: Repair Tools are not furnished with the Grinder.

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REMOVAL OF LOWER ARMATURE BEARING AND FAN

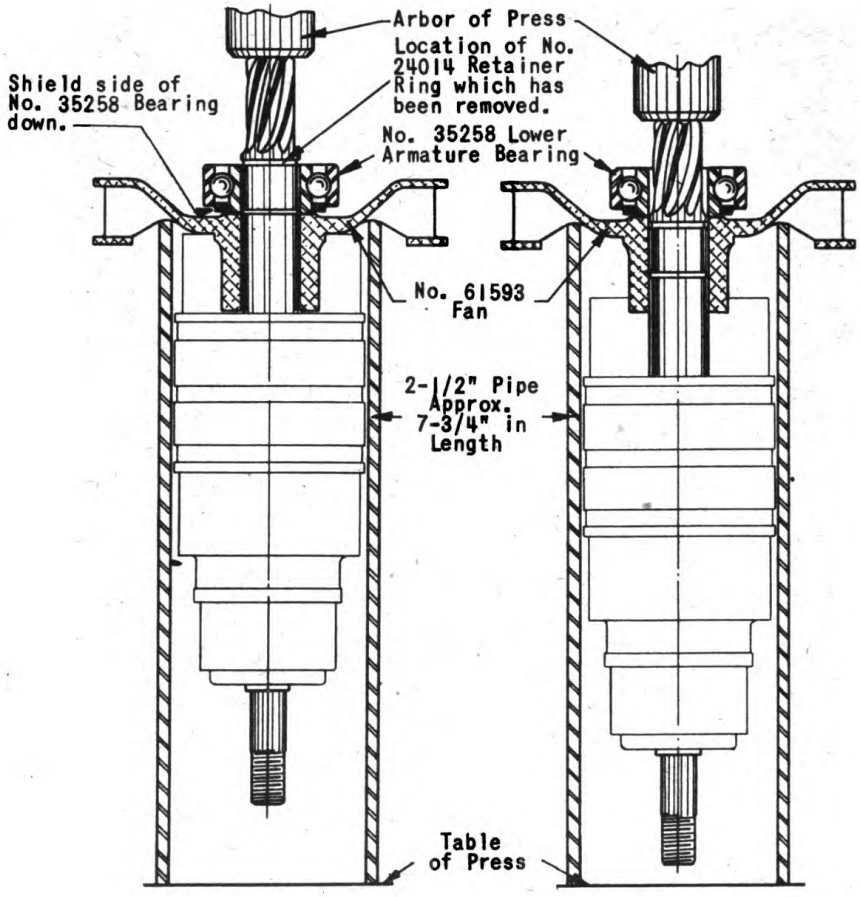

Figure 18

Figure 19

1. Snap off No. 24014 Retainer Ring (Not shown here)
2. Place Armature through the Pipe so that top edge of Pipe bears against the Fan as shown in Figure 18.
3. Exert pressure against end of pinion to press Armature shaft through the parts as shown in Figure 19.
4. The Bearing comes free first and is followed by the Fan.

Figures 18 and 19 show a method that may be used for removing No. 35258 Lower Armature Bearing. It will be noticed in this method that No. 61593 Fan must be partially moved from its assembled position, as shown in Figure 19, in order to remove the Bearing. The operation must be done carefully since damage to No. 61593 Fan might occur if the Bearing is tightly seated on the Armature Shaft. For this reason, this method is suggested only when a No. 67137 Bearing Puller is not available or when No. 61593 Fan must be removed also.

A 2-1/2" Pipe, approx. 7-3/4" in length and an arbor press are required.

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3. No. 35258 Lower Armature Bearing is a single side shielded bearing. It is very important that the Bearing is assembled onto the armature shaft so that its shielded side faces towards the No. 61593 Fan as shown in Figures 18 and 19.

4. Be sure to snap No. 24014 Ball Race Retainer Ring in place on Armature Shaft.

No. 61593 Fan (Figure 15)

Broken blades in No. 61593 Fan will cause an out-of-balance condition as well as a decrease in ventilation efficiency. Replacement of No. 61593 Fan is as follows:

1. The No. 61593 Fan is removed as shown in Figures 18 and 19.

2. Clean away all loose insulation scraps so that the Fan may be pressed tight against its inside shoulder.

3. Place small cylindrical insulation over fan hub before pressing fan onto armature shaft.

4. Line up key slot in fan with No. 36229 Key in Armature Shaft and press fan on by applying pressure to inside hub of fan The fan must lie square to the armature shaft.

5. The No. 63772 Armature and No. 61593 Fan must be balanced again as a unit. Solder, placed on the armature laminations, may be used for balancing.

No. 59597 Stator (Figure 15)

Inspection of No. 59597 Stator for open, grounded and short circuits:

1. OPEN CIRCUIT: An open circuit in the Stator may be determined by means of a Test Lamp as follows: Attach leads of Test Lamp to wire leads of Stator. If Test Lamp does not light, the circuit through the Stator is open in which case No. 59597 Stator must be rewound or replaced.

2. GROUNDED CIRCUIT: A grounded circuit may be determined by attaching lead wire of Test Lamp to one of the Stator Wire leads and touching the other lead from Test Lamp to the Stator laminations. If Test Lamp lights, a grounded condition is present in which case No. 59597 Stator must be rewound or replaced. It is for the protection of operator against this condition of grounded circuit that the Grinder should always be grounded through means of the grounding prong on the 3-prong plug.

3. SHORT CIRCUIT: A short circuit will cause wire insulation to burn away resulting in a strong pungent odor. No. 59597 Stator must be rewound or replaced.

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Adjustment of No. 59597 Stator in No. 63765 Field Case

If a new No. 59597 Stator is to be installed, in which case the Stator Set Screw Holes must be drilled in the Stator, it is necessary that the Stator is assembled in the Field Case in its correct position before drilling the holes.

Adjustment and drilling holes are as follows:

1. Assemble No. 59597 Stator into No. 63765 Field Case Assembly so that the 2 painted lines on Stator are closely matched with stator set screw holes in field case.

2. Tighten the 4 No. 20025 Stator Set Screws against stator just enough to prevent stator turning when operating the grinder.

3. If the free spindle speed of the grinder is more or less than the specified speed of 4000 R.P.M., the No. 59597 Stator must be rotated slightly to the right or left to obtain the required armature speed. Bearing in mind that the armature turns in the opposite direction to the spindle, the following rules may be used.

   A. If the armature runs faster than it should and consumes too much current, the stator should be turned in the OPPOSITE DIRECTION TO THAT IN WHICH THE ARMATURE REVOLVES.

   B. If the Armature runs slower than it should, consumes less current and has less power, the Stator should be turned in the SAME DIRECTION IN WHICH THE ARMATURE REVOLVES.

ADJUSTMENT OF STATOR IN FIELD CASE

Figure 20 shows method of turning and adjusting No. 59597 Stator in No. 63765 Field Case Assembly.

After determining proper position of No. 59597 Stator in No. 63765 Field case, drill 4 No. 10 (.1935 inch) holes in the stator from 3/32 inch to 1/8 inch in depth to match up with stator set screw holes in the Field Case. Tighten the 4 No. 20025 set screws securely. This completes the adjustment.

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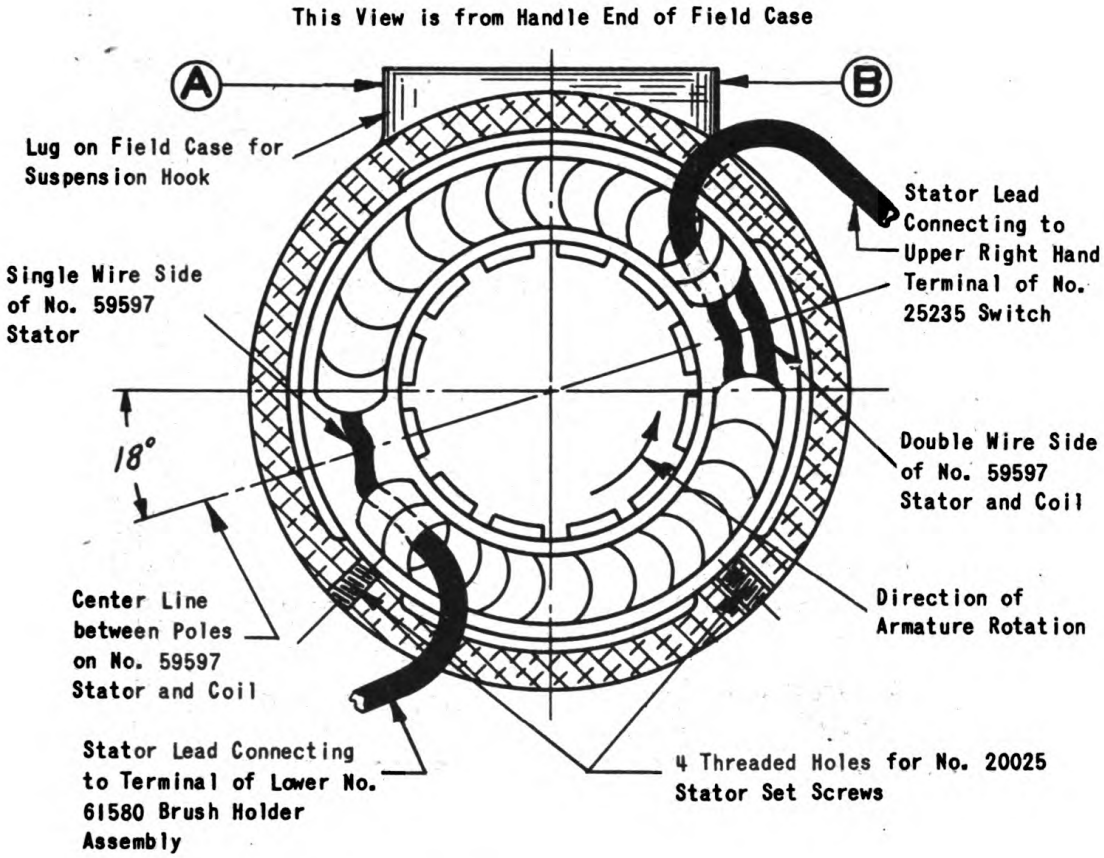

METHOD OF TURNING STATOR IN FIELD CASE:

1. To turn the Stator in Field Case in the same direction of Armature rotation, tap suspension hook lug with a soft hammer in direction of arrow (A).
2. To turn the Stator opposite to Armature rotation, tap suspension hook lug in direction of arrow (B).

The No. 59597 Stator and Coils may now be drilled with 4 No. 10 (.1935 inch) holes for the No. 20025 Stator Set Screws.

Figure 20
Adjustment of Stator in Field Case

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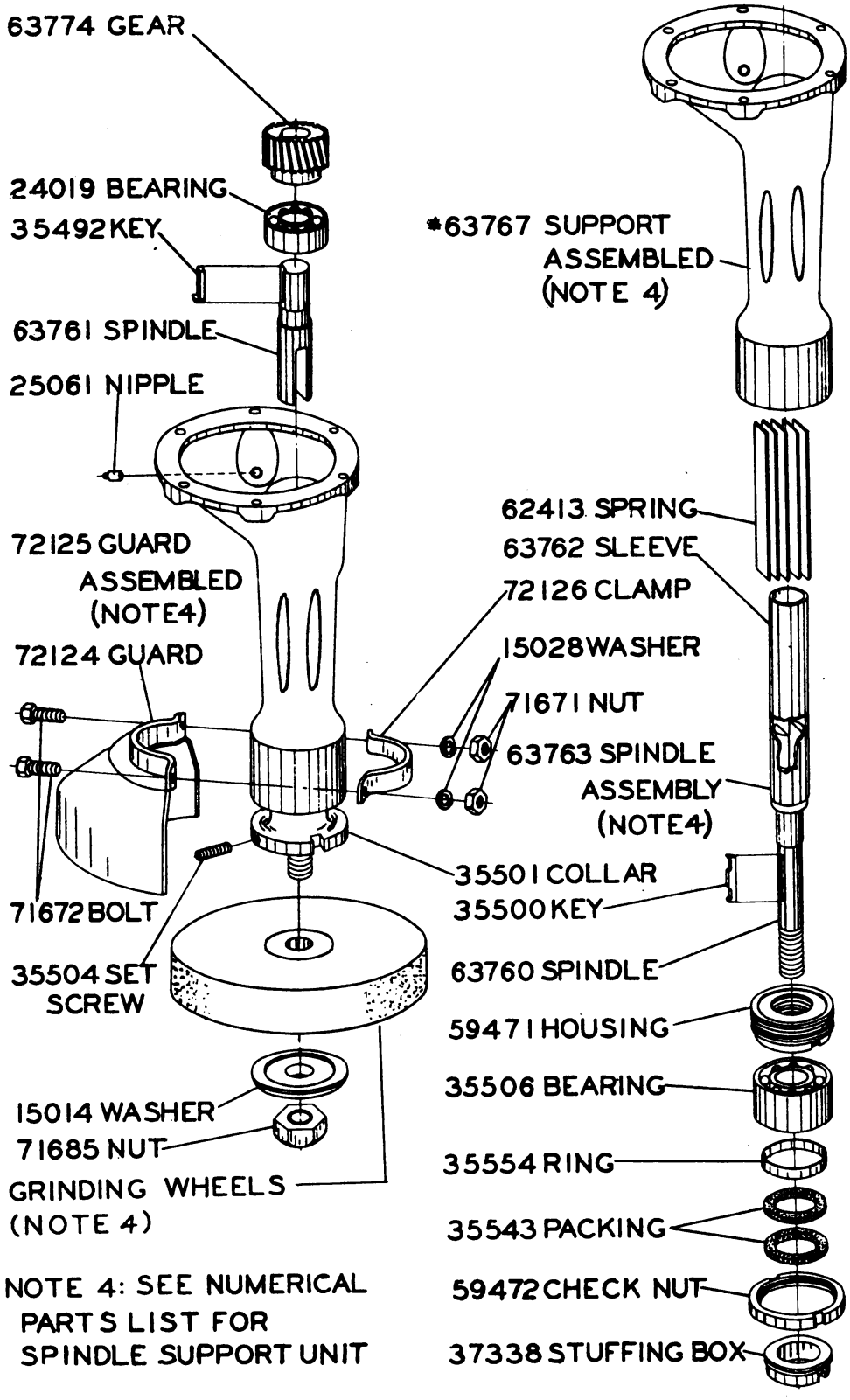
EXPLODED VIEW OF SPINDLE SUPPORT UNIT



NOTE 4: SEE NUMERICAL PARTS LIST FOR SPINDLE SUPPORT UNIT

Figure 21

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SERVICING OF SPINDLE SUPPORT UNIT (Figure 21)

Important parts, contained in the SPINDLE SUPPORT UNIT, which require inspection and replacement, if necessary, are as follows:

1. No. 24019 Inner and 35506 Outer Spindle Bearings
2. No. 63774 Spindle Gear.
3. No. 62413 Spindle Springs.
4. No. 35543 Outer Spindle Bearing Felt Packing.

No. 24019 Inner and 35506 Outer Spindle Bearings (Figure 21)

(Refer to "GENERAL SERVICING OPERATIONS FOR ALL BALL BEARINGS", Page 21.)

No. 24019 Inner Spindle Bearing is removed from No. 63767 Spindle Support Assembly as follows:

1. Pull No. 63774 Spindle Gear off No. 63761 Inner Spindle.
2. Tap upper end of No. 63767 Spindle Support Assembly against a block of wood to drive No. 24019 Inner Spindle Bearing and No. 63761 Inner Spindle down and out of the Spindle Support Assembly.

No. 35506 Outer Spindle Bearing is removed from No. 63767 Spindle Support Assembly as follows: (Figure 21)

1. Remove Grinding Wheel and No. 72125 Guard Assembly.
2. Loosen No. 35504 Driving Collar Set Screw and remove No. 35501 Driving Collar. Also lift out No. 35500 Driving Collar Key.
3. Unscrew No. 59472 Check Nut and No. 37338 Stuffing Box from No. 59471 Packing Housing in a clockwise direction (Left Hand Threads).
4. Unscrew No. 59471 Packing Housing out of No. 63767 Spindle Support Assembly in a counter clockwise direction (Right Hand Thread).
5. Tap lower end of No. 63767 Spindle Support Assembly against a wood block to drive No. 63760 Outer Spindle and No. 35506 Outer Spindle Bearing down and out of the Spindle Support Assembly.

No. 63774 Spindle Gear (Figure 21)

If the gear teeth in No. 63774 Spindle Gear are worn down on the sides, cracked or broken, the Gear should be replaced. If No. 63772 Armature is replaced thereby installing a new pinion gear on end of Armature Shaft, No. 63774 Spindle Gear should also be replaced.

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NUMERICAL PARTS LIST OF SPINDLE SUPPORT UNIT
For
No. U60 Model No. 3032 - Continued

Mfr's. Part No.	Nomenclature	No. of Parts Per Tool	Wt. each in Lbs.	Price per Part
	GRINDING WHEELS			
72329	Wheel, Grinding, 6 in. diameter, 1 in. wide, 5/8 in. arbor hole, vitrified bond, 36 grain, for general purpose and mild steel grinding . . .	-	2-3/8	2.15
72330	Wheel, Grinding, 6 in. diameter, 1 in. wide, 5/8 in. arbor hole, vitrified bond, 46 grain, for grinding hardened steel.		2-3/8	2.15
72331	Wheel, Grinding, 6 in. diameter, 1 in. wide, 5/8 in. arbor hole, vitrified bond, 24 grain, for grinding cast iron.		2-3/8	2.50
72332	Wheel, Grinding, 6 in. diameter, 1 in. wide, 5/8 in. arbor hole, vitrified bond, 30 grain, for grinding welds.		2-3/8	2.15
72343	Wheel, Grinding, 6 in. diameter, 1 in. wide, 5/8 in. arbor hole, resinoid bond, 20 grain, for grinding aluminum, brass and bronze. .		3	3.25

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EXPLODED VIEW OF THOR NO. 60 BENCH STAND, MODEL 3473

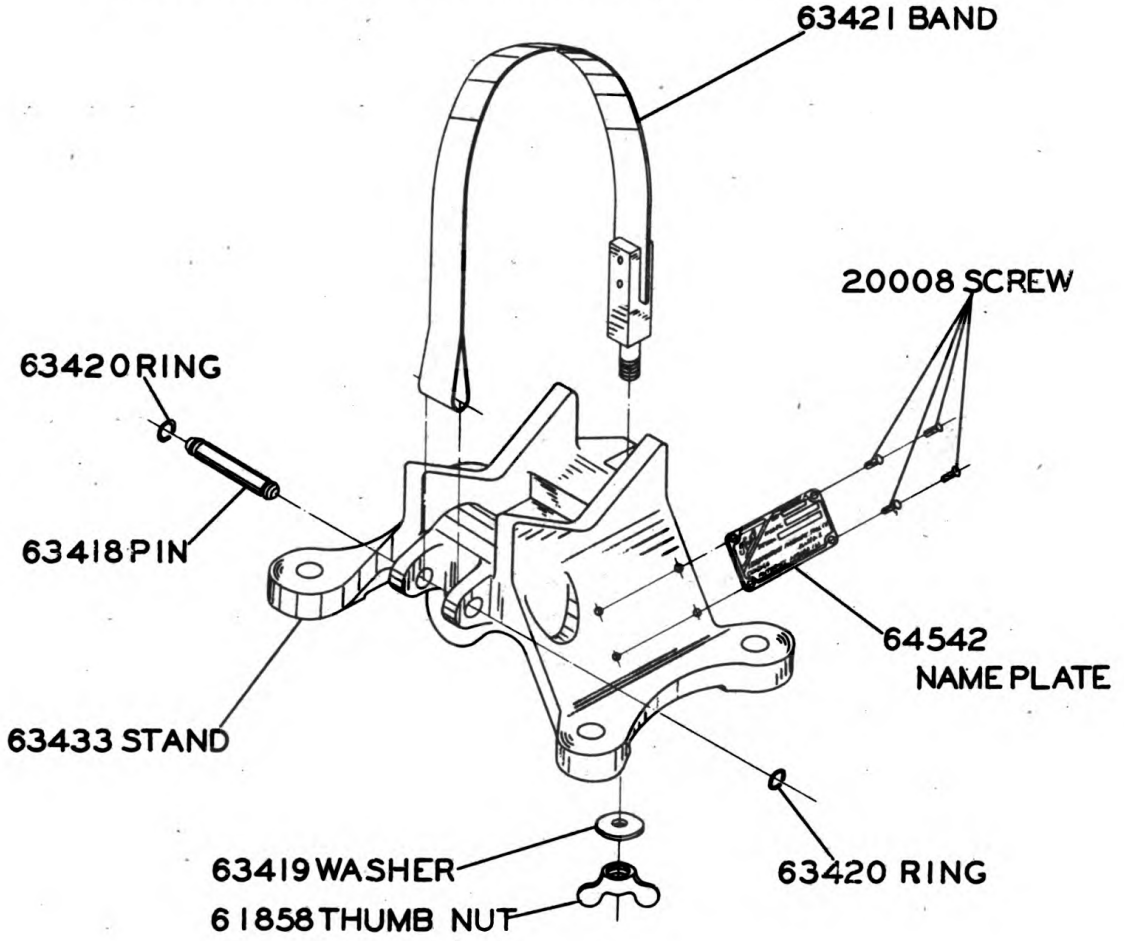

Figure 29

NUMERICAL PARTS LIST FOR THOR NO. 60 BENCH STAND, MODEL 3473
For
No. U60 Model No. 3032

Mfr's. Part No.	Nomenclature	No. of Parts Per Tool	Wt. each in Lbs.	Price per Part
20008	Screw, Name Plate.	4		$ .05
61858	Nut, Clamp Band Thumb.	1		.35
63418	Pin, Clamp Band.	1		.20
63419	Washer, Thumb Nut.	1		.05
63420	Ring, Clamp Band Pin Retainer.	2		.05
*63421	Band, Clamp.	1	1/4	1.75
63433	Stand.	1	5-1/4	9.20
64542	Plate, Name.	1		.10

* Sold only Assembled

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CROSS-SECTION VIEW AND PARTS IDENTIFICATION

No. U60 Electric Grinder, Model 3032

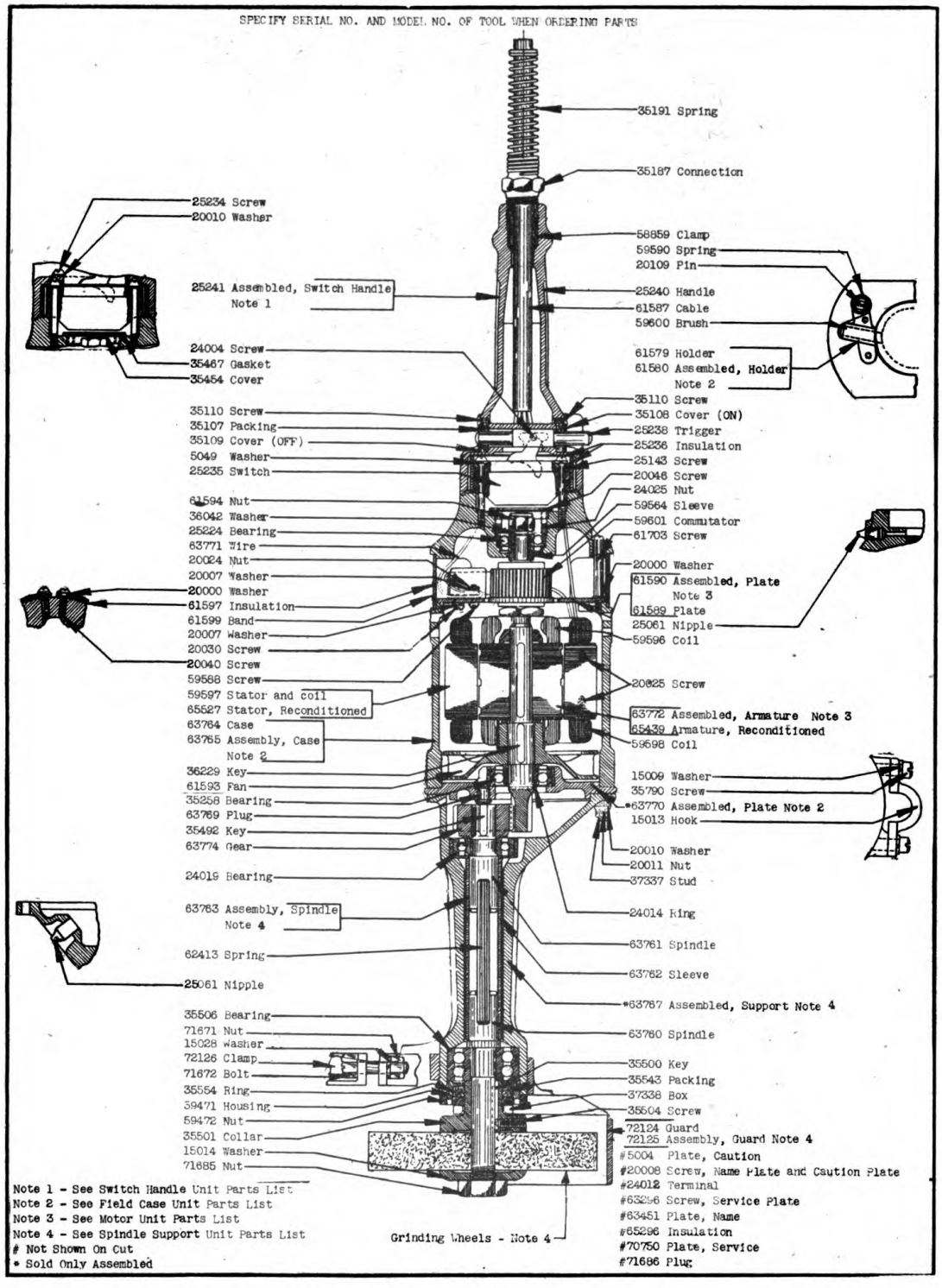

Figure 30

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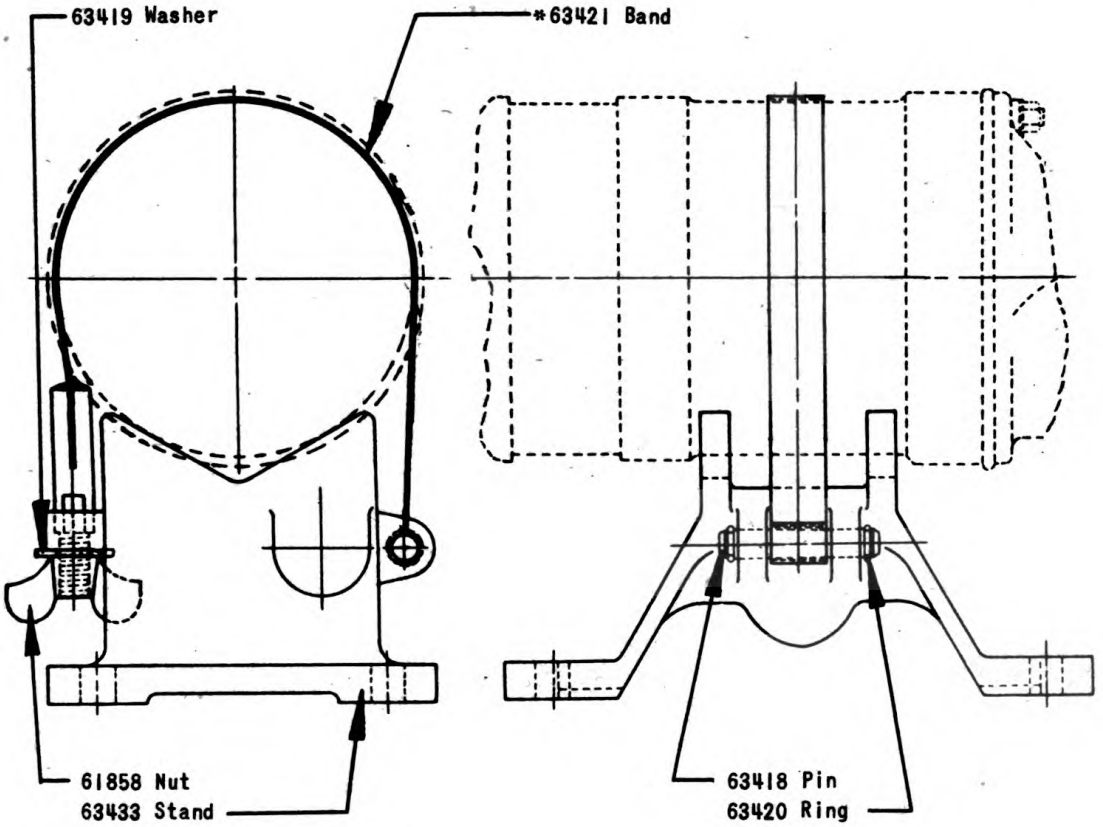
NO. 60 HORIZONTAL STAND



#20008 Screw, name plate
#64542 Plate, name

Not Shown On Cut
* Sold Only Assembled

Figure 31

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MEMORANDA

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MEMORANDA

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